COMPARATIVE ADVANTAGE IN PHILIPPINES RICE PRODUCTION

by

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D E C L A R A T I O N

Except where otherwise indicated, this sub-thesis is my own work.

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ABSTRACT

This study is an examination of the existence of comparative advantage in rice production in the Philippines and related policy issues.

The analysis and evaluation focused on the assessment of the net effect of government rice policies and on whether the country enjoyed a natural comparative advantage in rice production during the period 1978 to 1981. This analysis was extended to include competing crops, i.e., corn and sugar, in order to compare their relative merits. To measure the degree of comparative advantage, the study made use of measures of private profitability, net social profitability (NSP), and domestic resource cost (DRC). Effective rates of protection (ERP's) were also calculated for these crops.

The results indicate that, in general, government policies have been biased against agriculture. Within the agricultural sector, in relative terms the net effect of these policies have favoured rice and corn production while they discriminated against sugar production.

The results show that the Philippines had a comparative advantage in rice production between 1978 and 1981. The degree of comparative advantage in rice was found to be very sensitive to world rice prices.

Expanding the area under irrigation appears to be only marginally socially profitable and increasing irrigation investment needs careful reappraisal. If farmers have to bear the full cost of irrigation they

may be reluctant to shift from rainfed to irrigated production conditions because their private profits could be reduced.

At current yields, expanding corn production at the expense of rice production does not appear to be profitable. Sugar may be more competitive at world prices, but rice is still the most desirable crop to produce at domestic prices.

In the context of technology choice, the recommended rice technology, while socially more profitable, is less privately profitable than the farmers' "average" technology. This probably explains why farmers are reluctant to adopt the full recommended rice technology package.

Finally, technical change has been an important factor which enabled the Philippines to retain a comparative advantage in rice production. Thus, continuing technical change would be crucial to sustain this advantage. Investment in research which increases yields have been shown to have a high pay off, and this may be an area for more government investment.

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Chapter 1

Introduction

1.1 Importance of the Rice Industry

The Philippine economy is predominantly agriculture-based. Approximately 70 percent of total population, who are dependent on farming as a means of livelihood, are in the rural areas. Agriculture in which an approximate 50 percent of the labour force is employed is a major contributor to aggregate output and employment (David, 1982). Between 1955 and 1980, agriculture's share in net domestic production averaged 33 percent per annum; and about 74 percent of the country's exports come from agriculture.

Despite these facts, agriculture was actually neglected when industrialization was adopted as the overall development strategy. When industrialization did not stimulate a faster economic growth in the 1960's (Power, et.al., 1971, and; ILO, 1976), agriculture gained importance again. The government focused its attention to secure food self-sufficiency, the highest priority being given to rice. This change in orientation was motivated specifically by at least two factors. First, the country had a worsening food deficit and increasing rice imports aggravated balance of payments problems. Second, with the experience of the green revolution, the development of the "miracle" rice varieties renewed expectations that the country could become self-sufficient. High yields from modern rice varieties meant a boost to incomes of producers. Rice is the staple food, eaten daily by 80 percent of the population and contributes a major proportion of the household consumption basket; greater food availability meant lower food prices to consumers. Since rice is a major wage good there was potential for maintaining low wage rates facilitating industrial development.

1.2 Rice Policies

Rice policies evolved with the intention of achieving different, but often conflicting, objectives of self-sufficiency, lower consumer prices, stable prices, high farm incomes, more government revenues, etc. The long-term investment made by the government to achieve self-sufficiency was the improvement and establishment of physical infrastructure and institutional facilities like irrigation and research-extension systems. During the 1970's price support and credit schemes as well as a fertilizer subsidy were added. In the early 1970's consumers enjoyed subsidized rice prices through government controls when supplies were low both in domestic and world markets. Thereafter control of prices continued through price ceilings and complemented by imports when necessary. However, the government attempted to maintain price incentives to producers to stimulate growth in output. Thus, the twin goals of good prices for the producers and consumers were apparently satisfied.

After 1977 the country eliminated imports averaging seven percent of domestic production annually between 1970 and 1977. In 1977 the country became a net exporter of rice. By 1980/81, the government paid premiums of P0.07 per kilogram of export quality paddy sold by farmers to the government. Domestic rice prices have been higher than world (and export) prices since 1979 because of continued government price support.

1.3 Justification of the Study

A free-trade policy in contrast with protectionist policies is believed by many economists to provide highest levels of economic welfare for small countries with no market power in international trading. However, such a complete free-trade policy is rarely found in practice. Almost all countries adopt trade regimes which involve intervention of various kinds. For example some countries adopt protectionist policies in their drive to replace imports ; others promote exports, and some combine both these policies. These cases occur when countries face different priorities, factor endowments, and political, social, and economic conditions.

This study is intended to analyze the general impact of these numerous forms of intervention, i.e., those designed to provide social satisfaction, save foreign exchange during the import years, and thereafter, to earn foreign exchange. This study maintains that the above schemes adopted by the government were not costless, especially to society. Aside from incurring the direct cost of implementing the various rice policies, there could also be even more important indirect ones. The mixture of policies mentioned in Section 1.2 may have encouraged resource misallocation in the economy perhaps leading to, for example, the proliferation of inefficient producers in the rice industry.

The fundamental proposition that this study will examine is:

> whether the net effect of rice price policies followed during this period have conformed with the country's comparative advantage as determined by its relative factor endowment.

1.4 Objectives and Scope of the Study

The objectives of the study follow from the above proposition. These involve the analysis and evaluation of the following:

(1) social costs of government intervention in the Philippine rice industry in the drive to increase production,

(2) differential nature of incentives to alternative avenues of resource use such as planting other crops (sugar cane and corn), and

(3) rice export performance.

The study concludes with policy implications of the findings.

The first objective attempts to assess and evaluate the interrelationships between government intervention and the country's comparative advantage in increasing domestic rice production. A crucial part of this objective is the evaluation of the sensitivity of measures of comparative advantage to changes in economic variables. This examination should be able to identify whether there is evidence that the country has a comparative advantage in domestic rice production and whether increasing rice production in the Philippines is relatively efficient.

The second objective analyzes the impact of government policies on corn and sugar, and compares their degrees of comparative advantage with those of the rice industry. The third objective concerns the export performance of the rice industry. Since the country became a net rice exporter, excess stocks have been disposed of at a financial loss to the government. Therefore, an analysis of the export policies would be helpful in the government's choice of future policies.

Finally, the study concludes with a discussion of the economic rationality of alternative policies for increasing rice production, first to achieve self-sufficiency, and second, to export in order to earn foreign exchange. Within the limits of the study, some of these policy issues will be investigated.

The study applies the theories and arguments regarding comparative advantage, effective protection, and domestic resource cost provided by trade theorists such as Chenery (1961), Bruno (1962 and 1972), Balassa (1968), Corden (1966), and Pearson et al. (1976).

The study has six chapters. In Chapter 2, there is a discussion of the theoretical basis of analyzing the interrelationships between the impact of government intervention and the country's comparative advantage. It is followed in Chapter 3 by a discussion of the impact of government policy on the rice industry. This provides information on the protective structure in the Philippines and has suplementary information on economic indicators of possible sources of the Philippines' comparative advantage in increasing rice production. Chapter 4 contains the methodology for measuring the impact of government policies in the use of national resources by the rice industry. Chapter 5 contains the results of these estimations which further include the analysis on the relative performance of known rice substitutes (corn and sugar as competitors), while Chapter 6 summarizes and concludes the findings of the study.

Chapter 2

The Theory of Comparative Advantage, Effective Protection and Domestic Resource Cost: A Review

2.1 Comparative Advantage and Agricultural Development

The standard approach in the study of the principle of comparative advantage in development economies and international economics is to analyze whether some degree of relative efficiency in the performance of a particular economic activity exists in a certain country. By definition, a country has a comparative advantage in producing a good if the opportunity cost of producing the good is lower at home than in other countries (Chenery, 1961). In the analysis of resource allocation, the implications of the theory of comparative advantage are derived from international trade theory while its critics base their analysis on various growth theories.

Classical trade theory postulates that differences in relative cost of production (using one mobile factor only, i.e., labour) among countries determine production, and direction of trade (Ricardo in Johnson, 1968, Freeman, 1971, and Sodersten, 1980).

In contrast with classical theory, the contemporary trade theory using the two sector model attempts to show how prices are determined and why intercountry price differences might arise. Essentially, this is an application of static general equilibrium theory which is a concept of balance among interdependent economic forces. A price change in one commodity engenders variations in factor proportions, factor prices, and quantities of output as well as product prices resulting in adjustments. However, equilibrium, in theory tends eventually to be restored. The contemporary version focuses on the determination of an optimum pattern of production and trade through a comparison of the opportunity cost of producing a given commodity with the price at which the commodity can be imported or exported.

The Heckscher-Ohlin doctrine of comparative advantage is the basis of standard treatment of international trade. The Heckscher-Ohlin theorem states that a country will benefit from trade by producing commodities that use more of its relatively abundant factor (Caves, 1960, and Caves and Jones, 1977). This version, using two mobile factors of production, labour and capital, suggests that those countries relatively rich in capital will export capital-intensive goods, and countries that have elatively more labour will export labour-intensive goods.

However, there are arguments against production specialisation along Heckscher-Ohlin lines. One of these comes from growth theorists. This is on the issue of static general equilibrium which forms part of the Heckscher-Ohlin model. According to these critics, static and pure general equilibrium are actually never completely attained in an economy because of changes in consumer demands and propensities to spend, save, and invest, new technological developments, shifting competitive relationships, depletion of existing resources, and discovery of new ones. The modern theories of growth emphasize the importance of the interaction over time among producers, consumers, and investors in interrelated sectors of the economy. There is also importance attached to the sequence of production and factor use by sector (sectoral transformation) rather than on conditions of general equilibrium alone (Lewis, 1954; Rostow, 1956, and; Johnson and Mellor, 1961).

Critics within the field of international trade also emphasize the limitations of the Heckscher-Ohlin model. For instance, according to Johnson (1968) the model is restrictive in nature, in view of its assumptions, namely: (1) similar production functions between countries, and (2) immobile factor endowments, are at variance with empirical observations like: (1) international mobility of capital, economies of scale, and differences in technology, (2) "brain drain" or the issue of international movement of labour, and (3) "technology gap" between countries.

Foremost, the two-factor model is inadequate in applications to agriculture because as Johnson (1968) also suggested it misses out a third factor, i.e., land, which has been defined as a natural resource. It is necessary to include land as the third factor since it is land from which agricultural production largely comes. Jones (1971) developed a three-factor model emphasizing the importance of specific factors such as land. His model assumed that agriculture and manufacturing use two inputs, one specific to each sector (i.e. land for agriculture and capital for manufacturing) and one (i.e. labour) common to both. Anderson

(1980) argued that the usual two-sector Heckscher-Ohlin assumptions may not apply to developing countries. These countries have limited capital (including knowledge and skills) and wage rates in the agricultural sector are predominantly determined by per worker agricultural land endowment. In the process of development, incomes grow and capital is accumulated providing resources essential in agricultural and manufacturing production. Labour will be attracted to the manufacturing sector which will expand relative to the agricultural sector. Moreover, for any given level of capital accumulation per worker, the rate by which labour is transferred to the manufacturing sector would be faster, the lower the initial wage rate, or agricultural land endowment per worker. The three primary inputs in Anderson's model will always affect the two sectors by allowing (1) capital to be mobile within the two sectors, and (2) agricultural land endowment to affect labour mobility between manufacturing and agricultural sectors.

This recent version of comparative advantage suggests that initially countries rich in agricultural land are likely to export agricultural products and import manufactured goods. With capital accumulation and constant terms of trade, these countries will gradually shift from being a net exporter of resource-based products to being a net exporter of manufactures. The higher the endowment of land or natural resources, the greater is the capital accumulation necessary for the shift. The model is extended to allow for (1) other primary production like mining can take place and therefore compete with agriculture for the use of land and capital, (2) non-tradable goods and services are produced, and (3) the influence of demand and comparative growth factors. The first and last additions are significant to the agricultural sector of developing countries. The first one suggests that even resource-rich developing countries can lose comparative advantage vis-a-vis resource-rich developed countries in agricultural production if substitution of mining for agriculture occurs to a substantial degree. However, productivity of labour and land in agriculture can be improved with capital. situation in most countries is that agricultural producers have acquired sophisticated knowledge (capital) in the use of appropriate technology thus verifying this postulate. The last extension emphasizes that production and trade specialization depend not only on supply factors but also on factors like population growth and growth in per capita income which affect demand.

In summary, the implications of the importance of the factor land in agriculture are, (1) a country's comparative advantage in agriculture will be less the lower its endowment of agricultural land relative to say, mineral resources and non-farm capital , and (2) newly-industrializing resource-poor countries will have a faster rate of growth of imports of food and agricultural raw materials for labour-intensive manufacturing, the faster their industrialization. Moreover, resource-rich developed countries including those with high per capita incomes will strengthen their comparative advantage in primary products through periods when their industrial activity and incomes are growing less rapidly than in other resource-poor countries.

Anderson's theory with its extensions however, has a short-coming because it still contains the basic limitation of the modern version which was first observed by Naya (1967). This is the prevalence of factor-intensity reversals brought about by the substitutability of inputs in agriculture (higher than in industry). However, it would be difficult to rectify this problem because substitution parameters are not available. The bias is recognized and known but generally its extent is not.

The three-factor model of the theory using its more relevant aspects can provide useful analytical results. For instance, countries can continue to have comparative advantage in agricultural production, given an immobile factor like land. The soil, climatic conditions and past investment in agricultural research determine the size and shape of the production possibility surface in a given region. These together with favourable demand conditions, will determine relative prices and the most profitable output bundle to produce (Thompson, 1980).

Recent studies suggest that comparative advantage can be enhanced if dynamic interactions in world trade are adaptable to a country's policy orientation through export promotion (Kreuger, 1981). There is no a priori reason why benefits from export promotion can outweigh the gains from import-substitution. However, empirical research in recent years shows that benefits from an outward looking economy (or industry) do not only include widening the country's foreign income stream (capital accumulation and savings) but also technical and innovative means of increasing aggregate output (Bhagwati and Srinivasan, 1979, and Kreuger, 1981). Proponents of import substitution policies disagree. They have appealed to "dynamic" considerations of national priorities, economic conditions, differences in factor endowments, and infant industry considerations for departing from free or first-best static trade policies.

2.2 Demand and Supply of Protection

One of the common demands for protection or assistance to industries in developing countries has been the so-called infant-industry argument. Newly established industries would usually seek some tax incentives either through non-payment of taxes over a period of time, or in the case of an industry using some import components, exemption from duties or, for new import-competing industries, direct subsidies. Protection has been through imposition of tariffs or quotas on competing imports. In practice, however, long-established industries were subjected to government intervention not only to maintain viability but quite often also when social dissatisfaction over the government's treatment of primary cost items (e.g. food) imperils political and economic well-being of a developing country (Mangahas, 1975). Food security gets high priority in many developing countries including the Philippines. Some externalities connected with domestic production and marketing of an importable or exportable may be present and so an intervention close to the point of the distortive effects may be necessary.

Protection seems to strengthen an industry and can provide a valuable contribution to the welfare of the community immediately affected. Some interpret this support as facilitating income generation and distribution (Anderson, 1978); but the latter is difficult to achieve in developing countries. Related to this, whereas setting up or promoting an industry can secure jobs, a liberal trade policy that provides imports some margin to compete with local products might induce at least short-term unemployment.

Another case for tariffs is that of protecting an industry to counterbalance adverse consequences of assistance to other industries. This is an example of government intervention in developed countries that is distortionary in itself because losses generally exceed gains to those who benefit from compensation. By contrast, there may be no such compensation paid in developing countries because it is difficult to implement. The mechanisms to redistribute the new benefits are rather weak or non-existent. Whatever the income distribution consequences, the government is likely to provide assistance based on some perceived benefits (especially to itself). One of these is its being retained in power. However, governments also try to intervene if it senses fulfilment of political commitments and is able to provide social satisfaction.

2.3 The Theory of Protection

The theory of protection has made considerable advances, both in normative and positive economics (Corden, 1966, and 1971). The latter field has contributed substantially in understanding how the structure of nominal tariffs affects the domestic production pattern of a country (Grubel, 1971). As a protection measure, the effect of a tariff is to raise the cost of imports. As a result, the incentive for domestic production of an importable is likely to increase. When protection is not prohibitive, for a small country the resulting price difference between international and domestic prices is equal to the tariff which is referred to here as nominal protection (through tariffs). However, imports that are used as inputs are also likely to offset the incentive to increase production because tariffs also raise the cost of production.

Domestic producers can also be protected in a variety of ways not related to the imposition of tariffs, e.g. quantitative controls on imports like quotas. If there are quantitative controls on imports, nominal tariff rates understate the degree of protection. Thus, the concept of effective rate of protection was developed to assess more appropriately the extent of protection since decisions were affected by the protection of the processing activity rather than the product itself (Johnson, 1965; Balassa, 1968 and 1971; Grubel, 1971; Ruffin, 1971, and Wilkinson, 1971).

An industry's ERP is defined as the overall proportion by which that industry's value-added (gross value of the industry's production less costs of materials used) is raised by protection of that industry and lowered by taxes and protection to other industries (Corden, 1971). It shows how the overall protection structure discriminates between industries. And generally, those industries which require higher protection to compete with other industries either at home or abroad use national resources less efficiently. If industries were equally protected this would mean assisting none of them at all, hence it is important to know the structure of ERP's in an economy for useful implications to be drawn.

One of the important purposes of the development of ERP however, was to use the "price" of value-added to predict output and factor allocation at the margin under partial equilibrium conditions (Corden, 1966; Ethier, 1971, and Humphrey, 1971).

The theory, however, is constrained by its fixed physical-input coefficient assumption. When the tariff structure changes, price relationships change and induce substitution among inputs, then the ERP estimates have a bias which overstates the effective rates (Corden, 1966). Travis (1968) cited Balassa (1965) and Basevi (1966) who argued that the overestimation of ERP under that assumption can explain the divergence between nominal and effective rates to some extent. Pursuing these implications Anderson and Naya (1969) analyzed the bias in a Constant Elasticity of Substitution (CES) production function analysis and concluded that arriving at the true ERP is difficult because substitution parameters are usually not available.

Moreover, the theory of effective protection under the above assumption was unable (1) to predict the direction in which a tariff change reallocates domestic resources, and (2) to rank industries by comparative advantage or relative international efficiency.

In the light of these problems nominal and effective rates of protection broadly indicate the differential nature of incentives that the combination of tariffs, trade policies, and domestic subsidies and taxes create in the economy. Grubel (1971) summarizes NRP and ERP relationships showing first, that for any given nominal tariff, ERP is greater the smaller the value-added of a process. Second, ERP is an increasing function of output tariffs and a decreasing function of input tariffs. Corden (1971) also summarizes NRP and ERP relationships. For instance, if the nominal rate of the input is equal to the nominal rate of the output, then the output's effective rate will also be equal to its own nominal rate. Also, there is a direct relationship between the nominal and effective rates of output and nominal and effective rates of inputs. It is also possible that the effective rate can be negative even though the nominal rate is positive. And if there is no nominal tariff on output but there is a tariff on inputs, then the effective rate is also negative. In short, ERP's change in response to changes in nominal rates of both output and inputs.

2.4 Domestic Resource Cost

Bruno (1962 and 1972) defined DRC as a concept which relates to the real opportunity cost in terms of total domestic resources of producing (or saving) a net marginal unit of foreign exchange. This is more relevant in developing countries because markets are distorted and resources like foreign exchange are constraining. DRC can be used to measure social cost of protection, the valuation of domestic resources needs to be in terms of shadow prices to reflect social opportunity cost of using them. This approach has been discussed thoroughly by Bruno (1962), Krueger (1966), Balassa (1968) , and Srinivasan and Bhagwati (1978) in the context of the cost of using real resources including foreign exchange in the drive of certain countries to expand production.

The use of the DRC criterion has increased after criticisms of ERP as an investment criterion because of problems in prediction of resource allocation effects. The ratio of opportunity costs of alternative uses between outputs is given the term "shadow price" which can be thought of as the marginal rate of substitution between the "outputs" in question - the amount of one output which has to be sacrificed to obtain another output (Dasgupta and Pearce, 1978). An examination of the DRC criterion shows that, (1) tradable goods are valued at world (or border) prices, and preferably (2) domestic factors are valued at their second-best distortion-reflecting shadow prices (Bhagwati and Srinivasan, 1980). Valuation of tradable and primary factors at their shadow prices or opportunity costs are discussed in detail in Chapter 4.

This calculation of the shadow price however, is less than general because it is based on a partial equilibrium analysis that is valid only for relatively small changes in the economic structure. However, this can be "generalized" by conventionally defining it as the net contribution of a marginal unit to the national product. Modifications are made by evaluating the domestic resource cost coefficient at the opportunity cost of using foreign exchange (Chenery, 1961; Bruno, 1962, and; Krueger, 1966).

There is another advantage of using DRC. In the absence of better industry information, sensitivity criteria suitable for use in DRC approach can be used. Sensitivity analysis evaluates the change of the DRC coefficient from corresponding changes in costs of inputs or yields of the productive activity.

It has however, been criticised on the ground that its original use (as Bruno and Krueger did it) treats all domestically produced inputs as non-tradable. In Balassa and Schydlowsky's (1968) view, the Bruno-Krueger system penalizes intermediate input-using industries by valuing domestically produced intermediate inputs at domestic prices. Most often, these inputs can be imported at far less cost. Hence, costing inputs at domestic prices can give estimates of DRC that are biased upwards. Other limitations of the DRC approach are discussed in Warr (1983).

The DRC approach also should evaluate the protective effects of policies at the margin since what is relevant to policy is output increments. Warr (1983) suggested that DRC can illustrate the degree to which commercial policy has distorted resource allocation by calculating DRC of foreign exchange saved in highly-protected import-competing production and contrasting this with the same measure for relatively unprotected export- or import-competing production. However, this is difficult in practice because often there is no information on marginal cost of production at aggregate levels. If we can assume that marginal and average costs of different industries tend to move proportionately, then average costs can be used as a proxy for marginal costs. Then, DRC would illustrate the differential nature of incentives as indicated by the differential social returns from the allocation of resources in producing different products.

2.5 Empirical Applications in Agriculture

The application of these approaches to the Philippines rice industry was done in research coordinated by the Food Research Institute of the Stanford University as part of the project on the study of the political economy of rice in Asia (Pearson, et al., 1976). Based on the definition of comparative advantage in Section 2.1, Pearson et al. distinguished social from private profitability of rice production. Pearson et al argued that whereas an individual firm makes its decisions on the basis of market prices for its inputs and outputs, governments acting in the interest of the whole society should make its decisions on the basis of social prices of inputs and outputs. This requires the evaluation of net social profitability (NSP - defined as the net gain or loss associated with an economic activity evaluated using shadow prices) which can differ from private profitability. In social profitability calculations, all variables are evaluated at their opportunity cost, recognizing that there are basic market distortions.

The relationship between NSP and comparative advantage is straightforward. A country or region in a country has a comparative advantage in producing a commodity if the NSP of the activity is positive.

Using sensitivity analysis, Pearson, et.al. (1976) measured the extent to which DRC tends to change with changes in the cost of labour, in yields and world prices. Such results can give useful policy guidelines. However, their work covered a single year only. As Ahn (1982) showed, comparative advantage changes over time and a snap-shot analysis would be a poor indicator of relative efficiency from which investment decisions could be made. A knowledge of long-term trends of variables like prices is necessary. Given volatile world prices, this is often difficult to ascertain, but the long-term trends in DRC changes are more useful for investment appraisal.

The other weakness of the study was the use of averages rather than marginal figures in the analysis. There is an analtyical conflict between theory and empirical estimates of DRC because data on marginal products and marginal costs are difficult to obtain. Hence, great caution must be used in interpreting coefficients of DRC based on average to draw resource reallocation implications.

The study by Herdt and Lacsina (1976) on the Philippine rice industry emphasized that differences in technology used in production of rice explain the differences in relative efficiency between regions. Two limitations of this study, in addition to the above were: (1) the use of prices significantly higher than support and actual prices, both in domestic and world terms, and (2) the assumption that the Philippine peso was only slightly overvalued. A study using input-output data of 1974 found the peso to be 34 percent overvalued (Medalla, 1979) while Herdt and Lacsina used a figure of five per cent. In general, 1974 was a year with record world rice prices and measures based on those prices are likely to underestimate the degree of comparative advantage that may actually exist.

Chapter 3

Impact of Government Intervention on the Rice Industry

3.1 Pattern of Protection in the Philippines Rice Industry

The Philippines has adopted various policies which affected the rice industry both directly and indirectly through various forms of intervention. Both input and output prices of rice and most agricultural crops increased faster than those of the manufacturing sector between 1960 and 1974 (ILO, 1976). However, the incentive structure of government policy was effectively biased against the agricultural sector in 1965 (Power in Balassa, 1971). This was due to higher input prices, and trade taxes (e.g., export tax, export quota, and other levies) on traditional agricultural exports including sugar (David, 1982). Since low consumer prices tended to dominate the objective of food price policy, the government was expected to intervene in input markets in order to offset the former to maintain producer incentives. Gravity irrigation and rural institutional credit were subsidized. Although fertilizer was supposedly subsidized to farmers through the Masagana-99 Program (a scheme for increasing rice production), there appears to have been no actual subsidy between 1976 and 1981 (David, 1982). This happened because the government was also acting to protect the domestic manufacturing of fertilizer. Thus, while a subsidy was given to the fertilizer producers who were also importers, domestic prices were set at quite high levels.

The effects of policies on several industries in the economy are briefly summarized in the pattern of protection costs in the Philippines (Table 3.1). Protection of the manufacturing sector diminished in 1968 and 1974 in comparison with 1965 but many agricultural industries actually experienced negative nominal protection and small effective rates of protection between 1968 and 1974. Thus, the situation in the Philippines was biased against many agricultural industries including rice.

3.2 Trends in Rice Production and Productivity

Inspite of the developments discussed above, the rice industry has experienced high growth rates. Paddy production has expanded from about 5.2 million tons in 1969 to 8.1 million tons in 1981 (Table 3.2). This is an average annual growth rate of 4.58 percent between 1969 and 1981.

Continued growth in rice output is considered to be necessary to meet the expanding demand caused by growth of population and incomes. There are at least five factors that can help increase production, namely:

(1) expansion of harvested area under cultivation,

(2) expansion of irrigation systems,

(3) planting of HYV's,

(4) increased use of fertilizer and other chemicals,

(5) the improvement of milling technology, and

(6) extension services.

Table 3.1. Structure of protection in the Philippines, 1965 - 1974

INDUSTRIES	1965[a] Nominal	1965[a] Effective	1968[b] Nominal	1968[b] Effective	1974[d] Nominal	1974[d] Effective
	(per cent)					
A. Non-Manufacturing Industries						
Agriculture	13	17	-	24	-	4
Coconut	-8	-16	-	8	-6	-11
Fiber	-8	-12	-	39	0	-10
Tobacco	-8	-11	-	250	-4	-9
Rice	11	6	-	9	17[e]	17[e]
Corn	23	24	-	7	-	-
Sugarcane	38	52	-	-3	-	-
Coffee & Cacao	41	55	-	53	-	-
Fruits & Nuts	46	55	-	18	32	26
Vegetables	55	62	-	10	-	-
Root Crops	75	78	-	8	-	-
Fisheries	0	0	-	109	97	94
Forestry & Logging	-8	-26	-	15	-10	-25
Mining	3	-25	-	2	-4	-30
B. Manufacturing	30	61	-	44	-	43

[a] Balassa, B. (1972), Structure of Protection in Developing Countries, John Hopkins, Baltimore

[b] U.N. (1972), Intraregional Trade Projections, Effective Protection, and Income Distribution

[c] David, C. (1982), "Impact of Government Policies On Agricultural Incentives in the Philippines", Paper presented at the Second Western Pacific Food Trade Workshop, Jakarta

[d] Tan, N. (1978), "Effective Rates of Protection in the Philippines, 1974", Journal of Philippine Development, Vol. 5, No. 2, pp. 185 - 212.

[e] Herdt, R. & T. Lacsina (1976), "The Domestic Resource Cost of Increasing Rice Production", Food Research Institute Studies, Vol. 15, No. 2, pp. 213 - 231.

Table 3.2. Area, yield, and paddy production, 1969/70 - 1981/82

YEAR	Area (000 Hectares)	Yield Per Hectare	Total Production (000 Metric Tons)
69/70	3114	1.68	5233
70/71	3113	1.72	5343
71/72	3246	1.57	5100
72/73	3111	1.42	4415
73/74	3436	1.63	5594
74/75	3539	1.60	5660
75/76	3579	1.72	6160
76/77	3548	1.82	6456
77/78	3509	1.96	6895
78/79	3469	2.07	7198
79/80	3637	2.15	7836
80/81	3459	2.23	7723
81/82	3433	2.36	8108

Source: Bureau of Agricultural Economics, Philippines.

Until about 1960, growth in rice production was based primarily on an increase in the physical areas of land under cultivation, with relatively little change in technology and total factor productivity (Crisostomo and Barker, 1972). Between 1949 and 1959 growth in total inputs was greater than the rate of growth of total output, with land and labour dominating (Table 3.3). The increasing scarcity of arable land suitable for rice cultivation left fewer ways from which production could be increased at the beginning of the 1960's. Figures show that the area harvested to rice has remained relatively constant at an average of above 3.2 million hectares for quite some time now. Between 1958/59 and 1977/78, area harvested had grown only by 0.4 percent per annum (Onkingco, et al., 1982). The conscious effort towards land intensive strategies brought about by the limited land availability resulted in enormous technological change in rice production in the 1970's. This reversed the dependence on land expansion as the primary means of stimulating growth. Starting in the late 1960's output significantly increased as a result of the use of new technology.

The improvements in production and yield thereafter have been brought about by intensified land use with the help of irrigation, and the use of HYV'S and fertilizer. In an estimate of the impact of irrigation on yield, a study at IRRI using microlevel production function analysis showed that irrigation was very significant (Table 3.4). On average, 50 percent of yield increases can be attributed to the use of irrigation by allowing a second crop to be cultivated during the dry season. Casiple-Rola (1979) showed that productivity returns were high for investments in irrigation even at interest rates of 25 per cent.

Table 3.3. Annual growth rate of output, input and productivity in Philippine agricultural crops, 1955 - 1980

	1949-1959[a]	1959-1969	1969-1979	1959-1979	1949-1979
Total Output	3.8	4.0	6.8	5.4	4.8
Total Input[b]	4.3	2.3	4.0	3.1	3.5
Land:					
Cultivated Land Area	3.5	1.5	1.3	1.4	2.1
Crop Area	4.4	1.7	3.0	2.4	3.0
Labour (No. employed)[c]	3.6	0.7	4.0	2.3	2.7
Fertilizer	14.1	8.7	7.5	8.1	10.1
Land Productivity (Output per cultivated land)	0.2	2.5	5.3	3.9	2.7
Labour Productivity	0.2	3.3	2.7	3.0	2.1

a/ end years are 3-year averages centered at the year shown

b/ weighted average of index of cultivated land area, number employed and fertilizer using the following weights: 0.45, 0.50 and 0.05, respectively

c/ based on growth rate of total agricultural employment including crops, livestock and poultry, fishery and forestry

SOURCE: Table 4 of DAVID, C. (1982), "Impact of Price Intervention Policies On Agricultural Incentives in the Philippines".

Table 3.4. Impact of irrigation and modern rice varieties in paddy yields, Philippines, 1966/67 - 1978/79

YEAR	Percentage Yield Increase Due to Irrigation By Variety			Percentage Yield Increase Due to Modern Varieties By Irrigation Status		
	Modern	Traditional	All	Irrigated	Rainfed	All
66/67	52	21	27	30	4	20
67/68	52	30	38	23	5	24
68/69	59	49	56	10	3	22
69/70	44	24	36	14	3	14
70/71	25	22	25	5	2	9
71/72	42	27	40	19	7	20
72/73	52	57	58	12	15	22
73/74	33	50	41	8	21	23
74/75	55	59	60	18	21	30
75/76	54	50	56	17	14	25
76/77	45	59	53	20	29	39
77/78	58	45	65	44	32	54
78/79	56	46	61	36	27	46

Source: Ongkingco, P., et.al., (1980)

Between 1965/66 and 1980/81, the irrigated paddy area increased by 4.7 percent annually. In 1980/81, area irrigated was 47 percent of total harvested area used in rice production.

In 1966, the first of the HYV's were introduced. Based on the above IRRI study, an average of 30 percent of yield increases was attributed to the use of HYV's and adoption spread rapidly. In 1978/79 over 80 percent of the total rice area was planted to HYV's (Table 3.5).

The use of HYV's was correlated with an increase in fertilizer use. There is no available information on the breakdown of fertilizer consumption by commodity in the Philippines. However, the Fertilizer and Pesticide Authority (FPA) estimated in 1968/69 that 30 percent of all fertilizers and nutrients was applied to rice. Based on this, an IRRI study, which used the constant factor shares method, estimated that fertilizer applied to rice would have increased from 46.9 kilograms in 1969/70 to 68.4 kilograms per hectare in 1978/79 (Ongkingco, et.al., 1982). Furthermore, nitrogen use in kilograms per hectare would have increased from 11.2 in 1969/70 to 17.8 in 1978/79. This is still below the recommended amount of 64.5 kilograms of nitrogen per hectare (Ministry of Agriculture, 1981).

Achievement of the best results from HYV's requires adequate water control, careful attention to the timing of operations, improved farming practices including the control of weeds, pests and diseases, and the application of the appropriate type and quantity of fertilizer. Hence, the role of government policy became more

Table 3.5. Total paddy area by irrigation status and use of high yielding varieties of rice, Philippines, 1965/66 to 1980/81

Year	Irrigated	Rainfed	High Yielding Varieties (HYV's)	Percent of Area Planted To HYV's	Percent of Area Irrigated
	('000 Hectares)				
65/66	960	1543	–	–	31
66/67	1171	1480	366	14	39
67/68	1309	1514	701	25	39
68/69	1483	1407	1352	47	44
69/70	1346	1356	1354	50	43
70/71	1470	1278	1566	60	47
71/72	1332	1548	1826	63	41
72/73	1241	1436	1679	63	40
73/74	1494	1533	2176	72	43
74/75	1412	1674	2175	70	40
75/76	1496	1695	2301	72	42
76/77	1489	1658	2417	77	42
77/78	1515	1581	2457	79	43
78/79	1466	1581	2510	82	42
79/80	1606	1655	–	–	44
80/81	1639	1576	–	–	47

Source: BAEcon, Philippines

important because the adoption of these practices on a large scale depended in turn on the development of an effective, well-managed extension program. Studies have shown that the Filipino farmer has acquired substantial technical knowledge on the use of inputs like fertilizer and seeds of HYV's , though many recommendations were not followed because of input constraints (Alviar, et.al., 1978).

Improvements in milling recovery, while smaller in its contributions to output expansion, still seem significant. Higher growth rates of rice production in milled equivalent over that of paddy production have been recorded. In 1969/70, the milling rate was 60 percent of a given unit weight of paddy but in 1981/82, this had improved to 65.4 percent. Some authors suggested that the use of "cono" mills instead of "kiskisan" mills was one of the contributing factors to this increase (Mears, 1974, and; Deomampo and Sardido, 1979). However, a high proportion of broken rice still exists in the present milling systems (Unnevehr, 1982). The apparent increases in rice production could be partly due to a greater acceptance of broken rice because the Filipino consumer is less concerned about broken grains than aroma and variety. On the other hand, better quality is important in world markets.

3.3 Impact of Intervention on Domestic and International Trade

The desire of the government to provide remunerative rice prices to producers is reflected in the floor price schemes that were set up. Prior to 1975, farm gate paddy prices were higher than support prices. These differences were attributed to low domestic supplies and inadequate imports (Unnevehr, 1982). After 1975, as supplies increased, farm gate prices have tended to be lower than official government prices. Retail prices prior to 1978 were higher than official ceiling prices (Table 3.6). Since then the situation has been reversed.

The success of interventions made in defence of the regulated prices ultimately depended on international trade, since any deficit was supplied through imports and any surplus disposed of through exports. During the importing years, imports were subsidized whenever the world price was higher than the official ceiling price, see Table 3.6. Since the Philippines became a net rice exporter starting in 1977, exports were subsidized by the government to maintain prices favourable to producers. A wedge between domestic and international prices was created. Between 1978 and 1981, farm gate prices received by farmers increased more than between 1973 and 1977, but in real terms they have declined due to inflation.

Successful implementation of price policies affecting producers was initially limited because government paddy procurement was small. The National Food Authority (NFA) was mandated to purchase up to 10 percent of the marketable surplus per annum. But procurements were

Table 3.6. Farm and support prices of paddy, and wholesale and government prices of rice, 1973-1981

YEAR	PADDY [a]			RICE [b]				
	Farm Price (1)	Support Price (2)	Ratio 1/2	Manila Wholesale (MWS)	Philippine CIF (FOB)	Thai FOB 35% Broken	Official Ceiling Price	Actual Retail Price
	(in pesos)							
1973	0.77	0.60	1.28	1.31	2.24	1.75	1.11	1.55
1974	0.94	0.81	1.16	1.97	3.35	3.37	1.87	1.96
1975	0.98	1.00	0.98	2.08	2.21	2.20	1.90	1.94
1976	1.04	1.06	0.98	1.99	1.66	1.72	2.01	2.04
1977	1.00	1.10	0.90	2.05	(2.06)	1.67	2.10	2.11
1978	0.98	1.10	0.89	1.96	(2.28)	2.35	2.10	2.08
1979	1.04	1.25	0.83	2.14	(2.02)	2.19	2.36	2.28
1980	1.14	1.36	0.84	2.29	(2.22)	2.91	2.57	2.45
1981	1.30	1.50	0.86	2.61	(2.57)	-	2.85	2.72

SOURCE:

a/ BAEcon

b/ UNNEVEHR, L. (1982), "The Impact of Philippine Government Intervention in Rice Markets", paper presented at the IFPRI Rice Policy Workshop, Jakarta, August 17-20, 1982 below this target up to 1976 because producers preferred to sell to private traders (Table 3.7). The prices that the government was willing to pay producers were lower than prices offered by private traders. The mandate permitted the licensing of private warehouse owners and millers involved in various business operations except retailing. The procurement levels after 1976 exceeded the target, presumably because of increased supply and the new directives which increased official floor prices to a point above open market farm prices. However, in 1980/81, NFA purchases declined although it was still higher than the target, at 10.58 percent of the marketable surplus.

The inclusion of licensed private warehouse owners and millers as NFA agents in government domestic trade may have resulted in producers being paid lower purchase prices. The government has not removed sufficient supplies from the domestic market to maintain floor prices (Unnevehr, 1982). The collapse of effective farm gate prices was probably one of the reasons that the government directed NFA to buy 765,000 metric tons or 15 percent of the estimated marketable surplus of 5.1 million metric tons of paddy in 1982. Whether this, together with the new government directive in early 1983 to remove possible impediments to exports of rice, will prove to be more effective in enforcing floor prices is yet to be seen.

Table 3.7. Government paddy procurement, 1973 to 1981

Year	Marketed Surplus	Procurement	Percent Procurement of Marketed Surplus
	('000 metric tons)		
1973	3529	63.33	1.79
1974	-	-	-
1975	3763	201.00	5.34
1976	4041	268.10	6.63
1977	4116	634.10	15.14
1978	4283	513.40	11.98
1979	4670	756.80	16.20
1980	4587	485.40	10.58
1981	-	580.60	-

Source: Bureau of Agricultural Economics, Philippines.

3.4 Rice Exports of the Philippines

The country's rice exports are differentiated into two major groups based on use, namely: (1) non-glutinous rice, wholly-milled or semi-milled which is either polished, glazed or unpolished, for food purposes, and (2) non-glutinous rice in the husk for propagation purposes. The Philippines which became a net rice exporter only in 1977 has actually been a net exporter of rice for seed purposes as early as 1971 involving 7.3 tons and increasing to 20,000 tons in 1981 or an equivalent of 40,000 per year over the whole period (NFA, 1982). These exports attracted relatively higher prices, the highest of which was U.S.$424 per ton in 1980 (Table 3.8). Most of the deliveries went to various Asian nations, two countries in Africa (Egypt and Malagasy Republic) and even the United States of America.

In contrast, exports of rice for food purposes started only in 1977. The country's initial exports involved 4,200 metric tons to Indonesia. Indonesia, which is located near the Philippine archipelago has been the primary buyer of the country's rice exports. In 1980 alone, total deliveries involved 91,466 metric tons of rice valued at U.S.$26.9 million (NFA 1982). Indonesia has been the consistent buyer of low grade rice with 35 percent broken grains (Soombonsup, 1975). The Philippines, which produces rice with 25 to 45 percent broken grains because of inferior milling technology, is one of the suppliers of this low grade rice. Philippine f.o.b. prices for 35 percent broken quality rice are as, if not more, attractive than world (Thai) prices of the same quality. The highest price received by

Table 3.8. Volume and prices of Philippine rice exports, 1977 to 1981

Type & Price of Rice	1977	1978	1979	1980	1981[a]
		(metric tons)			
1. Non-glutinous for food purposes	14800	47044	164707	255910	74772
Value per ton ($US)	283	307	282	286	314
World (Thai) price per ton (35 % broken grains)	226	318	291	368	-
2. Non-glutinous for seed purposes	-	196	897	6480	19998
Value per ton ($US)	-	361	403	424	407

[a] preliminary

Source: National Food Authority(NFA), Philippines exports so far is U.S.$314 per ton in 1981.

The repercussions of continued government control on exports tend to insulate the domestic market from world demand for quality. The domestic milling industry has no incentive to become competitive in higher quality international markets. The problem is magnified when markets like those of Indonesia and other Asian countries like Vietnam which are capable of increasing output, dry up. This has already happened twice in 1981 and 1982, when Indonesia's imports dropped sharply because of bumper harvests. Therefore, a closer integration of the domestic and international markets, promoted by allowing private exports of rice or improving milling standards of NFA in line with its export promotion mandate may be required to make Philippine rice competitive in the higher quality markets. This may help to reduce the payouts for premiums of P0.07 per kilogram of export quality paddy sold by farmers to NFA. Also, export subsidies which are partly spent subsidizing the costs of separating and grading to meet the quality standards of some overseas buyers can be reduced (Central Bank of the Philippines, 1981). Otherwise, the increased subsidy costs (in the order of over ₱44 million between 1977 and 1981) brought about by the difference between domestic and export prices, could increase.

An examination of the Philippine rice balance sheet between 1977 and 1981 indicates that exports declined to 95,000 metric tons in 1981/82 (Table 3.9). This is equivalent to 7 per cent of domestic stocks ending 1981/82. Prior to this, the highest ever recorded delivery was

Table 3.9. Rice balance sheet of the Philippines, 1977/78 to 1981/82

Crop Year	Beginning Stock	Production	Total Supply	Exports	Seeds	Feeds & Waste	Food	Ending Stock	Exports as Percent of Ending Stock
	(0 0 0 metric tons)								
1977/78	836	4607	5450	46	189	304	3703	1208	4
1978/79	1208	4847	6055	38	194	330	3953	1540	3
1979/80	1540	5093	6633	165	204	346	4187	1731	10
1980/81	1731	5035	6766	256	201	341	4526	1442	18
1981/82	1442	5303	6745	95	212	345	4668	1425	7

Source: Bureau of Agricultural Economics, Philippines.

in 1980/81 at 256,000 metric tons or 18 percent of reserves.

As a new rice exporter, the Philippines' capacity to export would depend on increasing production and inventories, as maintaining domestic supplies still dominates government policy. A substantial stock in 1979/80 helped to increase exports in 1980/81, especially to Indonesia whose production declined during this year. The increase in exports reduced inventories in 1980/81 and this problem was aggravated by a reduction of domestic production of 58,000 metric tons compared to 1979/80. Thus, in 1981/82 exports declined.

Philippines as a small rice exporter is a price taker in the world market. However, government policies have affected peso prices of exports by overvaluing the peso, and have made Philippine rice (and other) exports more expensive and less competitive in the world market. High levels of domestic inflation during the 1970's and towards the 1980's have tended to further reduce the competitiveness of exports. The improvement in quality of rice exports, and a more realistic exchange rate are likely to provide a stimulus to export. In the recent period, the peso has been allowed to depreciate substantially and in June, 1983 was devalued by a further 7 percent.

Reports indicate that a poor harvest due to adverse weather may result in there being no exportable surplus in 1983. This again demonstrates the fact that the Philippines is at present only a marginal rice exporter. Continuing substantial investment in irrigation is required to even maintain self-sufficiency (Herdt,

1982) and a major policy issue is whether such investment is economically desirable.

Chapter 4

Measuring the Impact of Government Policies on the Use of Resources by the Rice Industry

In this chapter the analytical measures discussed in Chapter 2 will be described and the computational methods used in the study are presented.

4.1 Nominal and Effective Protection

The concept of the nominal rate of protection (NRP) is used to estimate the degree to which trade tax policies distort nominal output prices relative to those which would exist under a free trade situation. In algebraic form, it is defined by

$$NRP_j = \frac{P_j^D - P_j^B}{P_j^B} \quad \text{where,} \qquad \text{i.e. } \Delta \text{ nominal prices}$$

NRP_j - is the nominal rate of protection on the jth commodity

P_j^D - is the domestic price of commodity j, and

P_j^B - is the border price of commodity j

The above equation can be used to measure output price distortions. It can be also used to measure tradable input price distortions, but the ERP concept is usually preferred.

The effective rate of protection is analytically a more useful concept for assessing the effects of protecting an industry. There are three crucial assumptions used in deriving the ERP (Corden, 1971). First, there is a fixed physical input coefficient in domestic rice production which implies constant costs and zero elasticity of substitution among inputs. Secondly, there is the small open economy assumption, implying that foreign supply elasticities for all inputs and outputs are infinite. And thirdly, trade remains even after the imposition of tariffs. The above assumptions greatly facilitate the investigation of problems by allowing a framework for partial equilibrium analysis.

The effective rate of protection is defined by first letting the unprotected or free trade production values to be: (following Corden, 1971)

$$1 = \Sigma x_{ij} p_i^B + \Sigma x_{kj} p_k^B \qquad \text{............... (1)}$$

where,

1 - world market price of output is unity

x_{ij} - amount of physical inputs i per unit of output j

x_{kj} - amount of primary inputs k used per unit of output j

p_i^B - world (border) market price of physical input i

p_k^B - world market price of primary input k

On the other hand, let the protected or actual production values be:

$$1 + t_j = \Sigma x_{ij} p_i^B (1 + t_i) + \Sigma x_{kj} p_k^B \quad \text{..............} \quad (2)$$

where,

t - is the proportion by which domestic market prices exceed world market prices due to tariffs and other protective instruments

It is assumed in the analysis that while products and material inputs are traded, primary inputs are not, therefore, the world market price of outputs and material inputs are increased by the amount equal to t while leaving the world price of primary inputs unaffected thus,

Let $x_{ij} p_i^B = a_{ij}$ .... value of tradable (material) inputs

$x_{kj} p_k^B = a_{kj}$ .... value of primary (factor) inputs

Substituting these in (1) and (2), we get,

$$1 = \Sigma a_{ij} + \Sigma a_{kj} \quad \text{..............} \quad (3)$$

$$1 + t_j = \Sigma a_{ij} (1 + t_i) + \Sigma a_{kj} \quad \text{..............} \quad (4)$$

And setting (3) equals v_j as the value-added per unit of commodity j at world prices, and

(4) equals v_j' as the value-added per unit of commodity j at domestic prices, then

$$v_j = 1 - \Sigma a_{ij} \quad \text{..............} \quad (5)$$

and $$v_j' = (1 + t_j) - \Sigma a_{ij} (1 + t_i) \quad \text{..............} \quad (6)$$

Now, let E_j be defined as the effective rate of protection on commodity j such that,

$$E_j = \frac{v_j' - v_j}{v_j} \qquad \text{.............. (7)}$$

Thus, algebraically:

$$E = \frac{[(1+t_j) - \Sigma a_{ij}(1+t_i)] - [1-\Sigma a_{ij}]}{[1-\Sigma a_{ij}]} \qquad \text{............. (8)}$$

$$= \frac{1+t_j - \Sigma a_{ij} - \Sigma a_{ij} t_i - 1 + \Sigma a_{ij}}{1-\Sigma a_{ij}}$$

$$= \frac{t_j - \Sigma a_{ij} t_i}{1 - \Sigma a_{ij}} \quad \text{or} \quad \frac{t_j - \bar{t}_j \Sigma a_{ij}}{1 - \Sigma a_{ij}}$$

$$\text{or} \quad t_j + \frac{\Sigma a_{ij} (t_j - \bar{t}_j)}{1 - \Sigma a_{ij}} \qquad \text{............. (9)}$$

where,

$\bar{t}_j = \Sigma a_{ij} t_i / \Sigma a_{ij}$ - the weighted average tariff rate on inputs of commodities into the jth industry. [In this study, the average of tariffs is drawn from Herdt and Lacsina (1976).]

4.2 Domestic Resource Cost

The DRC concept was discussed in Chapter 2. Here, the domestic resources considered are the values of labour, land, capital, and non-tradable inputs. These values are taken at second-best shadow prices. Leaving value-added in the same world prices as those used in estimating ERP, the domestic resource cost per unit of foreign exchange earned or saved through the jth industry becomes the ratio : (following U.N., 1972, and; Islam, 1980)

$$\left[\frac{\text{Value of labour + land + interest + cost of using capital + non-traded goods}}{\text{Output in world prices - domestic tradable inputs in world prices - imports}}\right] \gtreqless ak$$

where,

a - the multiplier used in converting the official exchange rate (OER) into its shadow exchange rate

k - the official exchange rate

The above expression can be rewritten as follows:

$$\left[\frac{\text{Value of labour + land + interest + cost of using capital + non-traded goods}}{\text{Output in world prices - domestic tradable inputs in world prices - imports}}\right] \gtreqless 1$$

The denominator is expressed in world (or border) prices at the ruling exchange rate. The calculated DRC in the above formulation gives the social opportunity cost necessary to earn (save) a net marginal unit of foreign exchange through the jth industry. In other words, for optimal domestic resource allocation, industry j should be expanded, remain as it is, or be contracted if DRC of industry j is less than, equal to, or greater than one.

The use of DRC is premised on four assumptions. These are (1) the world price of product j is given exogenously, (2) the incremental costs of production are determined by a given technology and a set of relative factor prices assumed to be constant, (3) elasticity of input substitution is zero, and (4) shadow prices of outputs, inputs, and foreign exchange can be calculated. Assumptions numbers (2) and (3) emphasize the static, partial equilibrium nature of DRC (like ERP) and emphasize that comparisons of DRC coefficients over time can only be made if input-output data are available on a time series basis or if production technology and growth patterns do not substantially alter input mixes and domestic factor costs.

Assumption (4) is crucial. Shadow prices of factors of production in this study are defined in terms of social opportunity costs of using the factors in their best alternative employment. These shadow prices apply to primary factors while shadow prices of tradable outputs and inputs are border prices. In addition non-tradable input costs are divided into tradable input costs and primary domestic costs.

4.3 Methodology

All the above measures are applied to input-output data on crop production obtained from the Ministry of Agriculture of the Philippines. The data were sorted, classified and subjected to a disaggreated analysis. This analysis was based on; (1) existing data of rice production surveyed by the Ministry, (2) the recommended rice technology through Masagana-99 Program, (3) irrigated versus rainfed conditions, (4) comparison of relative efficiency of production between rice, corn, and sugar, (5)changes of comparative advantage in rice production in a span of four years ending in 1981, and (6) sensitivity of relative efficiency of rice production to changes in costs of relevant variables.

In calculating NRP, ERP, and DRC, private and social costs are distinguished from each other, and differentiated between private and social profitability as follows:

(A) Private Profitability is calculated by letting, (following Akrasanee and Wattananukit, 1976)

(1) Gross Domestic Price of Output = current price of wholesale milled rice (or corn or sugar)

(2) Tradable Inputs at Actual Market Prices = material component of tradable inputs like seed, fertilizer, chemicals, and the material component of non-

tradable inputs like irrigation, and processing and transportation. The method of calculating these costs follows Herdt and Lacsina (1976)

(3) Value-Added in Actual Prices = (1) - (2)

(4) Factor Costs Other Than Capital = primary costs of labour, land (rents+payments made in kind for the use of land), unallocated cost or non-tradable component of the tradable inputs in (2)

(5) Private Profitability = (3) - (4); in practice, indirect taxes are also deducted from (3) but there was no information on sales and excise taxes in rice production.

(B) Net Social Profitability is calculated by letting,

(6) Gross Border Price of Output = border (world) price of milled rice, i.e., f.o.b. and c.i.f. prices during export and import years, respectively and border price of corn and sugar when appropriate

(7) Tradable Inputs at World Prices = material components of tradable and non-tradable inputs valued at social opportunity cost or at prices at which inputs like seed and fertilizer can be exported or imported instead, respectively. The opportunity cost of fertilizer is equivalent to the average c.i.f. prices of urea, ammonium sulfate, and complete fertilizer, excluding social costs of domestic marketing and storage which are classified as

non-tradables

(8) Value-Added in World Prices = (6) - (7); this is equivalent to v_j^* in equation 6 of section 4.1

(9) Domestic Resource Cost Other Than Capital = primary costs of labour, land, and unallocated costs valued at social opportunity cost. The opportunity cost of labour (including family labour) is assumed to be equal to the average wage rate of hired labour. This assumption implies that the labour market is well-developed as it is considered to be in the Philippine context. The labour market is quite competitive especially in peak seasons and labour is quite mobile within production areas. The opportunity cost of using land is an imputed value based on the highest return from planting alternative crops. Social values of unallocated costs are assumed to be similar to actual private costs.

(10) Social Profitability = (8) - (9)

(11) Domestic Capital Cost = cost of using capital valued at opportunity cost

(12) Net Social Profitability = (10) - (11) and valued at OER

(13) Ratio of SPFX to OER = set at 1.34 in all calculations, based on Medalla (1979)

(14) Net Social Profitability at SPFX = the product of the value-added at world market prices and the

ratio of SPFX to OER less all costs of domestic resources used in rice production

(C)Protection Coefficients And Domestic Resource Cost are calculated by letting,

(15) Nominal Protective Coefficient on Output (NPCO) = ratio of gross value of production in domestic prices to gross value of production at world prices per kilogram of rice

(16) Nominal Protective Coefficient on Input (NPCI) = ratio of tradable inputs valued in domestic prices to tradable inputs at world prices

(17) Effective Protection Coefficient (EPC) = ratio of value-added in domestic prices to value-added at world prices

(18) Domestic Resource Cost (DRC) = ratio of all cost of domestic resources to value-added at world prices

Since the border price has been defined as unity, calculation of NRP and ERP simply involves subtracting NPCO, NPCI, and EPC from the value of the border price. This can be further expressed in percentage terms by multiplying the difference by 100.

Chapter 5

Comparative Advantage of Philippine Rice Production: Results and Discussion

The estimates of the impact of government policies on domestic rice production are discussed in this chapter. The analysis concerns issues relating to allocative decisions and hence to choice of technology.

Estimates of effective rates of protection (ERP's) are first discussed to give an overview of the present pattern of protection between rice, corn, and sugar production.

In the discussion, the technology that is followed by the farmers in irrigated systems is called the "average technology". The technology which is recommended by Masagana-99 Program is called the "recommended technology".

In the analysis, a comparison was made between these two technologies to derive implications for technology choice.

The relative economic performance of growing rice rather than other feasible crops was examined in the study. Likewise, the economics of the average technology under irrigated conditions with rice production in rainfed conditions was examined to determine converting rainfed into irrigated rice areas would be desirable.

5.1 Effective Rates of Protection, 1978 - 1981

The ERP's of rice, corn, and sugar production, computed on the basis of procedures described in Chapter 4, are given in Table 5.1. The net effect of government intervention as reflected in the ERP estimates showed that rice as well as corn have enjoyed a small positive effective rate of protection, while sugar has had negative effective rate of protection in recent years. Based on these estimates, the net effect on welfare of government policies appears to have discriminated against sugar production while favouring rice and corn production. Comparing other estimates of ERP in previous years (see Table 3.1), rice and corn have enjoyed small positive effective rates of protection which have remained relatively unchanged, though in the case of corn, its ERP in 1981 was lower than the ERP during the mid-sixties. The major change over this time period was in sugar which had a relatively high level of portection in 1965, but became negative in 1968, and remained negative (at a somewhat higher rate) in 1978.

Since manufacturing had continued to enjoy a relatively high level of protection throughout the whole period, the overall policies of the government have continued to be biased against agriculture in general. Within the agricultural sector, the discriminatory nature of government policies are analyzed in the next two sections based on the social profitability of rice, corn, and sugar production.

Table 5.1. Effective rates of protection in rice, corn and sugar production, 1978 to 1981

Item	YEAR			
	1978	1979	1980	1981
Average	-3	18	14	12
Recommended	33	15	13	10
Irrigated	-5	16	12	10
Rainfed	-14	11	8	4
Corn	-	-	-	10
Sugar	-19	-	-	-

SOURCE: Bureau of Agricultural Economics, Philippines.

5.2 Choice of Technology

The domestic resource cost (DRC) coefficients at the shadow price of foreign exchange (SPFX) of the average and recommended technology are given in Table 5.2. These estimates are consistently less than unity. These imply that both technologies appear to be relatively efficient and indicate that the nation has a natural comparative advantage in rice production for either technology.

While the actual values changed over the period 1979 and 1981, the DRC's at SPFX of the recommended technology are consistently lower than the average technology. Examination of social profits at SPFX, the "net social profits" (NSP) also indicates that the recommended technology has a higher NSP than the average technology. But private profitability of the recommended technology is lower than the average technology by an average of P0.04 per kilogram of rice output.

These results imply that the majority of farmers have no incentive to change to the recommended technology despite its social desirability, and can help to explain why farmers are reluctant to fully adopt the recommended technology. This suggests that there may exist an economic argument for government intervention to eliminate the divergencies between private and social profitability. Such government intervention may lead to an increase in the net contribution of the rice industry to aggregate national output. However, the method of intervention will have to be carefully examined to ensure that its benefits would indeed be higher than potential costs. In this regard, it is likely that recent steps to deregulate

Table 5.2. Private and social profitability, protection coefficients, and domestic resource cost of rice production, 1976 to 1981

Item	Average Technology[a]				Recommended Technology[b]			
	1978	1979	1980	1981	1976	1979	1980	1981
	(pesos per kilogram)							
Private Profitability	0.61	0.90	1.27	1.21	1.13	0.99	1.15	1.14
Social Profitability (at OER)	0.12	-0.01	0.19	0.01	0.33	0.29	0.33	0.43
Social Profitability (at SPFX)	0.72	0.52	0.90	0.69	0.79	0.84	0.94	1.17
NRPO (%)	-14.00	6.00	3.00	1.00	19.00	6.00	3.00	1.00
NRPI (%)	-42.00	-39.00	-43.00	-37.00	-45.00	-31.00	-37.00	-32.00
ERP (%)	-3.00	18.00	14.00	12.00	33.00	15.00	13.00	10.00
DRC (at OER)	0.93	1.006	0.89	0.99	0.76	0.82	0.81	0.77
DRC (at SPFX)	0.69	0.75	0.66	0.74	0.56	0.61	0.60	0.57
Yield (kg. per hectare)	2171	2750	2810	2935	3650	3950	4000	4050

[a] existing technology; 1976 data unavailable

[b] under the Masagana - 99 Program - a scheme of increasing rice production; 99 means 99 cavans, equivalent to 4950 kilograms of yield per hectare as a target; 1978 data unavailable

Source: Basic Data: Ministry of Agriculture, Philippines the fertilizer industry may prove helpful. Already, domestic fertilizer prices have declined and are now closer to international prices.

5.3 Choice of Crop

5.3.1 Rainfed Rice, Corn, and Sugar Production

A comparison between rainfed rice, corn (shelled), and sugar (centrifugal) production attempts to analyze the net effects of government policy. The importance of rice has been discussed in Chapter 1, but corn and sugar are also important crops. Corn is the staple food of about 20 percent of the population, is second in importance to rice in terms of area cultivated and, is a major component of the animal feed industry. Sugar is an important export crop, although the area it occupies is smaller. It has contributed around 25 percent of crop value-added annually, and as an export crop, on average it has accounted for 26 percent annually of total agricultural exports during the period 1955 to 1980.

The estimated profitability measures and DRC coefficients at SPFX of rainfed rice, corn, and sugar production are presented in Table 5.3. The various estimates of profitability and relative efficiency in rainfed rice production change over time, but these indicate that the country has had a comparative advantage as the DRC coefficients at SPFX are less than one for each year.

Table 5.3. Private and social profitability, protection coefficients, and domestic resource cost of rainfed rice production, 1978 to 1981

Item	Rainfed Rice Production			
	1978	1979	1980	1981
	(pesos per kilogram)			
Private Profitability	0.58	0.85	1.13	1.25
Social Profitability (at OER)	0.22	0.08	0.17	0.14
Social Profitability (at SPFX)	0.87	0.66	0.78	0.89
NRPO (%)	14.00	6.00	3.00	1.00
NRPI (%)	-17.00	-23.00	-26.00	-17.00
ERP (%)	-14.00	11.00	8.00	4.00
DRC (at OER)	0.89	0.95	0.93	0.94
DRC (at SPFX)	0.66	0.71	0.69	0.70
Yield (kg. per hectare)	1650	1710	1615	1830

Source: Basic Data, Ministry of Agriculture, Philippines

Corn (shelled) production does not appear to have any comparative advantage; in 1981, the DRC coefficient at SPFX is greater than one (Table 5.4). Corn production can improve its comparative advantage if attempts to raise yields by using modern (hybrid) varieties are successful, i.e., if yields are raised from one to three or four tons. While it is hazardous to draw firm conclusion from a single year figure, it must be noted that world corn prices in 1981 were substantially higher than in many previous years. Therefore, the conclusions that at current yield levels, corn is uneconomic can be rather strongly argued.

Meanwhile, estimates of NSP of sugar production in 1978 indicate a lower degree of comparative advantage compared with rice. The NSP is lower compared to 1978 NSP of rainfed rice production (Table 5.5). This means that sugar production in 1978 was less efficient than rice.

Further analysis of the three crops' private and social profits (see Tables 5.3 - 5.5) indicates that private and social profits of rainfed rice production are greater than from corn.

It may be noted that in some cases DRC and NSP give different rankings of the crops. This arises from weaknesses of the DRC criterion as an indicator of social profitability - in particular, this is due to the fact that as a ratio it is affected by how benefits and costs are defined. The DRC suffers from the problem of arbitrary reassignments of benefits as negative costs and costs as negative benefits. Generally, NSP is to be preferred over DRC as an investment

Table 5.4. Private and social profitability, protection coefficients, and domestic resource cost of corn production, 1975 and 1981

Item	1975	1981	Maisagana Program[a] 1981
	(pesos per kilogram)		
Private Profitability	0.05	0.05	0.23
Social Profitability (at OER)	-0.42	-0.36	0.05
Social Profitability (at SPFX)	-0.12	-0.07	0.28
NRPO (%)	-5	8	8
NRPI (%)	0	0	0
ERP (%)	-6	10	13
DRC (at OER)	1.47	1.42	0.92
DRC (at SPFX)	1.09	1.06	0.69
Yield (kg. per hectare)	875	1060	3690

[a] scheme of increasing corn output through the promotion of planting corn hybrids, IPB varieties, and white corn

Source: Basic Data, Ministry of Agriculture, Philippines

Table 5.5. Private and social profitability, protection coefficients, and domestic resource cost of sugar production, 1978

Item	Sugar Production 1978 (pesos per kilogram)
Private profitability	0.18
Social profitability (at OER)	0.27
Social Profitability (at SPFX)	0.59
NRPO (%)	-14
NRPI (%)	0
ERP (%)	-19
DRC (at OER)	0.70
DRC (at SPFX)	0.53
Yield (kilograms)	4810

Source: Ministry of Agriculture, Philippines.

criterion. For a discussion of this issue see Warr (1983) and Emerson (1983).

Assuming constant costs in sugar production and analyzing the sensitivity of NSP and DRC to changes in border prices indicates that while recent rather low border prices decrease NSP's (DRC's increase) they continue to be positive. Border prices of recent years are still higher than the levels in 1978. In fact prices in 1978 were the lowest during the period from 1975 and 1983 (Table 5.6). Border prices have to drop below P850 (equivalent to U.S.$115) per ton before sugar production in the Philippines would lose its comparative advantage, i.e., NSP to become negative and DRC to exceed one (Appendix Figure 1). However, this is subject to the assumption of constant costs; if domestic costs have risen, the relevant border price would be higher.

5.3.2 Irrigated Rice, Corn, and Sugar Production

In this section we ignore the fixed cost of irrigation of irrigated rice production on the grounds that it is sunk capital. Then the estimates of DRC coefficients at SPFX are less than one during the period 1978 to 1981 (Table 5.7). The analysis indicates that in irrigated rice production, the Philippines has a comparative advantage.

Unfortunately, only limited comparisons with irrigated corn and sugar production can be made. The study did not have data available for irrigated corn and sugar production. Hence, comparisons are made

Table 5.6. Border prices of (centrifugal) sugar, 1975 to 1983

Year	U.S. Dollar (per ton)	Pesos (per ton)
1975	597	4444
1976	317	2351
1977	209	1544
1978	175	1292
1979	183	1381
1980	347	2747
1981	383	3142
1982[a]	205	-
1983[a]	271	-

[a]June only, Far Eastern Economic Review

Source: FAO Trade Yearbook, various issues

Table 5.7. Private and social profitability, protection coefficients, and domestic resource cost of irrigated rice production, 1978 to 1981

Item	Irrigated Rice Production[a]			
	1978	1979	1980	1981
	(pesos per kilogram)			
Private Profitability	0.61	0.90	1.27	1.21
Social Profitability (at OER)	0.47	0.40	0.65	0.53
Social Profitability (at SPFX)	1.10	0.98	1.29	1.26
NRPO (%)	-14.00	6.00	3.00	1.00
NRPI (%)	-24.00	-16.00	-19.00	-13.00
ERP (%)	-12.00	10.00	7.00	5.00
DRC (at OER)	0.75	0.76	0.66	0.75
DRC (at SPFX)	0.56	0.57	0.49	0.56
Yield (kg. per hectare)	2171	2750	2810	2935

[a]excludes fixed cost of capital of irrigation

Source: Basic Data, Ministry of Agriculture, Philippines

with rainfed corn and sugar production. The relevant estimates for rainfed corn and sugar production were given in the previous section. It is noted that these figures probably underestimate the profitability and relative efficiency of these crops when grown under irrigated conditions.

Subject to these limitations, rice production appears to remain more profitable and efficient than corn production (in 1981) in irrigated areas. Both private profits and NSP's of rice production in irrigated areas are higher than those of sugar production in 1978. These imply that irrigated rice is unlikely to be replaced by these other crops, and that such replacement is not desirable from a social viewpoint.

5.4 Investments in Irrigation

In this section, the economics of investment in irrigation is analyzed. This focuses on converting existing rainfed rice areas into irrigated conditions. Here, fixed costs of irrigation which were ignored in the previous section, assume great importance.

The DRC's of irrigated and rainfed rice production are given in Table 5.8. Even when the full costs of irrigation are included, the DRC's continued to be less than one. Further analysis indicates that private profit estimates in irrigated rice production are generally slightly greater (except in 1981) than the private profits in rainfed conditions. However, NSP's of irrigated rice production are lower than those of rainfed rice production, as a consequence of allowing

Table 5.8. Private and social profitability, protection coefficients, and domestic resource cost of irrigated and rainfed rice production, 1978 to 1981

Item	Irrigated Rice Production[a]				Rainfed Production			
	1978	1979	1980	1981	1978	1979	1980	1981
	(pesos per kilogram)							
Private Profitability	0.67	0.90	1.26	1.19	0.58	0.85	1.13	1.25
Social Profitability (at OER)	-0.14	0.21	0.44	0.32	0.22	0.08	0.17	0.14
Social Profitability (at SPFX)	0.45	0.76	1.05	0.99	0.87	0.66	0.78	0.89
NRPO (%)	14.00	6.00	3.00	1.00	14.00	6.00	3.00	1.00
NRPI (%)	-45.00	-36.00	-39.00	-30.00	-17.00	-23.00	-26.00	-17.00
ERP (%)	-5.00	16.00	12.00	10.00	-14.00	11.00	8.00	4.00
DRC (at OER)	1.08	0.87	0.75	0.85	0.89	0.95	0.93	0.94
DRC (at SPFX)	0.80	0.65	0.56	0.64	0.66	0.71	0.69	0.70
Yield (kg. per hectare)	2286	2635	2695	2820	1650	1710	1615	1830

[a]includes fixed cost of capital of irrigation

Source: Basic Data. Ministry of Agriculture, Philippines for the full cost of irrigation. These results imply that producers would be reluctant to shift from rainfed to irrigated rice production if they have to bear the full cost of irrigation. Furthermore, given that the social profitability of irrigating new areas appears to be declining and is very slight in any case, there appears to be grounds for a comprehensive examination of the government's irrigation policies.

5.5 Sensitivity of Domestic Resource Cost Coefficients

World rice prices are very volatile and technological change can increase yields. Therefore, values and costs of production are subjected to a sensitivity analysis to account for changes in prices and yields. Elasticities of DRC's are obtained by recalculating the DRC coefficients assuming a 20 percent increase in costs of some inputs. The elasticity is defined as the proportional change in the cost of the input under consideration divided by the proportional change in DRC coefficient.

Results are presented in Table 5.9. These indicate that generally increases in domestic resource cost or loss in relative efficiency in rice production were primarily caused by declining border prices, decreases in yields, and increasing cost of land, labour, and irrigation. For instance, a DRC elasticity for border price of -0.99 for average technology indicates that a 0.99 percent increase in border prices is needed for improving relative efficiency by one percent. It is also quite sensitive to increases in

Table 5.9. Domestic resource cost elasticities of Philippine rice production

Variables	Average Technology	Recommended Technology	Irrigated[a]	Rainfed
Labour	4.80	2.65	4.14	4.31
Land	2.84	3.80	3.96	1.88
Capital	12.72	9.50	12.80	9.71
Irrigation	2.73	3.80	3.02	-
Processing & Transport	4.48	5.70	4.00	6.54
Fertilizer	38.89	12.67	10.16	13.60
Yield	-1.27	-1.14	-0.98	-1.35
World Price	-0.99	-1.02	-0.97	-1.03

[a] includes fixed cost of irrigation

social cost of irrigation with a DRC elasticity of 2.73. This means that only 2.73 percent increase in the cost of irrigation is needed to reduce relative efficiency by one percent. Differences in sensitivity among the systems of production are also indicative of the (1) capital intensiveness of the Masagana - 99 technology and the (2) land-extensiveness and importance of irrigation cost in the irrigated production system compared with the rainfed system. The DRC of the rainfed system with respect to land is quite sensitive but this was not primarily due to its land-extensiveness but rather to the high returns obtainable from planting alternative crops. In contrast, DRC coefficients of all the systems are relatively insensitive to increases in the price of fertilizer and farm capital. For instance, using average technology, the cost of fertilizer has to increase by 38.89 percent before there is a reduction in relative efficiency by one percent. This is because the proportion of these costs in the total cost structure is small (Appendix Table 6). [Farmers in the Philippines have not used the recommended high amounts of fertilizer. Therefore, their expenditures on this input were small.] These indicate that the country's comparative advantage is only marginally affected by changes in their input prices in the range examined.

The most important determinant of changes in comparative advantage appears to be the world price of rice. World prices of rice have been quite volatile in the past, though the long-term trend has been a decline in real terms (Palacpac, 1982). If the world price of rice were to drop below U.S.$222 per ton, at the margin the relative efficiency of rice production would disappear (Figure 1).

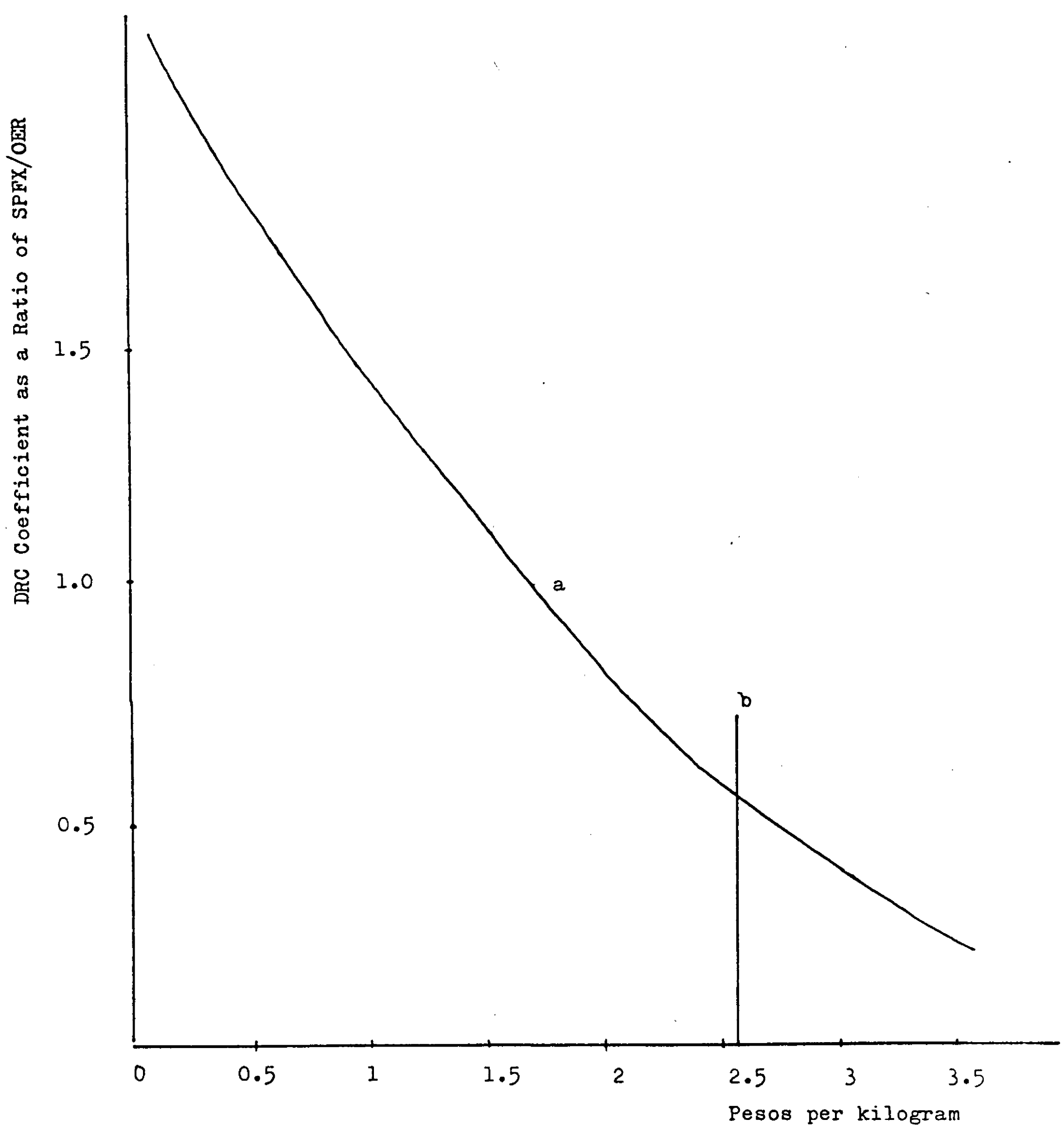

Figure 1. Sensitivity of DRC to Changes in World Rice Prices

[a]border price at which Philippine rice production would lose its comparative advantage; equivalent to P1700 (or U.S.$222) per ton

[b]border price of rice in 1981

5.6 Summary of Results

The Philippines appears to have enjoyed a natural comparative advantage in rice production during the period 1978 to 1981.

The official recommended technology has higher social profitability, but the farmers' "average" technology has higher private profitability. Hence, farmers are not likely to shift to recommended technology in the absence of appropriate government intervention to offset this divergence between private and social profitability.

Converting rainfed rice lands to irrigated conditions appears to be marginally socially profitable. However, private benefits are lower than the additional private costs of irrigation and farmers are unlikely to have adequate incentive to bear the full cost of irrigation.

At current yields, corn is not competitive with rice in rainfed environments, though sugar may emerge as an important competitor, depending on world price movements. In already irrigated areas, rice appears to have high private as well as social profits.

The country's comparative advantage in rice production is relatively little affected by changes in fertilizer and capital prices, but is very sensitive to world rice prices and also to land, labour, and irrigation costs.

Chapter 6

Summary and Conclusions

In general, Philippine government policies have been biased against agriculture. However, attempts were made to revitalize the rice industry, particularly in the 1970's.

Various policies evolved with the intention of achieving different, often conflicting, primary goals like low consumer prices, self-sufficiency, and maintenance of rural incomes.

Direct government intervention took place in many aspects of production and trade in the rice industry. The government monopolized foreign trade. It also adopted a "two-price" system in support of producers and consumers through floor price and ceiling price policies respectively. The government made some direct purchases from producers through the state marketing agency, the National Food Authority. However, this was usually inadequate to effectively maintain floor prices. It fairly successfully controlled consumer prices after 1978 when an exportable surplus began to emerge. In terms of farm inputs, the government subsidized credit and irrigation costs. Widespread use of these inputs together with fertilizer, chemicals, and seeds of modern rice varieties provided the basis for a major increase in production. Additional government support was provided through research and extension.

In this study, analysis and evaluation focused on the assessment of the net effect of these government policies and on whether the country enjoyed a natural comparative advantage in rice production during the period 1978 to 1981. This analysis was extended to include competing crops, i.e., corn and sugar, in order to compare their relative merits. To measure the degree of comparative advantage, the study made use of measures of private profitability, net social profitability (NSP), and DRC. Effective rates of protection (ERP) were also calculated for these crops.

The net effect of government intervention as reflected in the ERP estimates showed that in the more recent years, rice as well as corn have enjoyed a small positive degree of protection. Meanwhile, sugar has had negative protection. Thus, in relative terms, the policies have descriminated against sugar production while favouring rice and corn production. Compared with ERP's in previous years, rice and corn enjoyed positive protection which has remained relatively unchanged, though in the case of corn, its ERP in 1981 was lower than the rate during the mid-sixties. The major change over time in this respect was seen in sugar production which had relatively high levels of protection in 1965, which became negative in 1968, and remained negative (at a somewhat higher rate) in 1978. Since manufacturing continued to enjoy a relatively high level of protection throughout the whole period, overall government policies have continued to be biased against agriculture in general.

The results of the analysis confirmed that the Philippines had enjoyed a comparative advantage in rice production during the period studied. Various issues now become relevant for policy. For instance, whether the degree of comparative advantage could support a viable export industry and whether continuing large-scale investment in irrigation is justifiable become important. Likewise, issues pertaining to choice of technology and crop substitution are important.

In general, the degree of comparative advantage in rice was found to be very sensitive to changes in world rice prices. World rice prices have historically been very volatile. Since real world rice prices have tended to decline over time, the present degree of comparative advantage could be reduced in the future if this trend continues. Thus, policies affecting the rice export industry should take careful account of these possible future developments. At the margin, the Philippines should expand, maintain, or contract production when the change in world prices would cause DRC coefficients to be less than, equal to, or greater than one. When short-term fluctuations can change DRC, it is very important to consider the long-term trend in deciding policy.

In terms of irrigation investment, expanding the area under irrigation appears to be only marginally socially profitable. Again depending on world rice prices and costs, even this margin may disappear. Hence, the policy of increasing irrigation investment needs careful reappraisal. If farmers have to bear the full cost of irrigation, irrigated rice production will not be privately profitable to farmers. Thus, they may be reluctant to change from rainfed to irrigated rice production unless the government continues to subsidize irrigation costs or other measures are taken.

At current yields, corn production at the expense of rainfed or irrigated rice production does not appear to be profitable. Sugar may be more competitive but privately and socially, rice is still the most desirable crop to be grown. Prospects for world sugar prices do not appear very bright and Philippine export markets are under pressure from competing sugar exporting countries and increased domestic production in those countries. Hence, it is unlikely that this situation would change much in the near future.

At present, the recommended technology is socially more profitable than average farmer's technology, though the former is privately less profitable. This probably explains why farmers are reluctant to adopt the full recommended technology package. Some form of government intervention may be desirable to eliminate these divergencies between private and social profitability. However, such interventions should be carefully evaluated to ensure that their social costs are not greater than their benefits.

The recent deregulation of an important input industry - fertilizer, is a welcome move, and would be of assistance, though its impact is not likely to be very substantial, as fertilizer costs will have to change by very large amounts to make an appreciable change in DRC.

Finally, it is important to recognize that technical change has been an important factor which enabled the Philippines to retain a comparative advantage in rice production during the period considered. Continuing technical change would be crucial to sustain this advantage. Investment in research which increased yields have been shown to have a high pay off, and this may be an area for more government attention.

In concluding this chapter and the whole study, despite the aggregate nature of industry information, a better understanding has been achieved of the impact of government intervention on the country's comparative advantage of producing rice, corn, and sugar. However, the study suffers from a set of limitations. Some of the methodological weaknesses of the various measures used to analyze the degree of comparative advantage were reviewed in Chapter 2. Other major limitations arise from the data which were available for this study. Primarily, the data available for competing crops were inadequate. Of the competing crops, only corn and sugar production could be considered. Even then, data for these two crops were available only for a single year for rainfed conditions. Even for rice, only aggregate data for the entire country were available. Regional and more disaggregated data, particularly for different agro-climatic environments would have enabled analysis to concentrate on the "marginal" areas.

However, the major implications drawn in this study appear to be sufficiently strong to warrant further research into reappraising some major policy areas such as the strategy of increasing production through large-scale irrigation investment and the importance of investment in technological change. Finally, the determination of the pattern of comparative advantage would have been more meaningful if analysis could cover more major industries in the economy.

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APPENDICES

Table 1. Cost and Returns of Rice Production, 1976 to 1981

	Average Technology					Recommended Technology			
	1978	1979	1980	1981	:	1976	1979	1980	1981
			(pesos per kilogram)						
1. Gross Output at Actual Market Prices	1.96	2.14	2.29	2.61	:	1.99	2.14	2.29	2.61
2. Tradable Inputs at Actual Market Prices	0.31	0.27	0.26	0.35	:	0.16	0.27	0.27	0.35
3. Value-Added (1 - 2)	1.65	1.87	2.03	2.26	:	1.83	1.87	2.02	2.26
4. Factor Cost Other Than Capital, Market Prices	1.04	0.97	0.76	1.05	:	0.70	0.88	0.87	1.12
5. Private Profitability (3 - 4)	0.61	0.90	1.27	1.21	:	1.13	0.99	1.15	1.14
6. Gross Output at World Market Prices	2.28	2.02	2.22	2.57	:	1.66	2.02	2.22	2.57
7. Tradable Inputs at World Market Prices	0.50	0.44	0.45	0.55	:	0.29	0.39	0.43	0.51
8. Value-Added (6 - 7)	1.78	1.58	1.77	2.02	:	1.37	1.63	1.79	2.06
9. Domestic Resource Cost Other Than Capital	1.56	1.48	1.47	1.90	:	1.01	1.27	1.39	1.52
10. Social Profits (8 - 9)	0.22	0.10	0.30	0.12	:	0.36	0.36	0.40	0.54
11. Domestic Capital at Opportunity Cost	0.10	0.11	0.11	0.11	:	0.03	0.07	0.07	0.07
12. Net Social Profits at OER (10 - 11)	0.12	-0.01	0.19	0.01	:	0.33	0.29	0.33	0.47
13. Ratio of SPFX to OER	1.34	1.34	1.34	1.34	:	1.34	1.34	1.34	1.34
14. Net Social Profits at SPFX (8x13-9+11)	0.72	0.52	0.90	0.69	:	0.79	0.84	0.94	1.17
15. NPCO (1/6)	0.86	1.06	1.03	1.01	:	1.19	1.06	1.03	1.01
16. NPCI (2/7)	0.58	0.61	0.57	0.63	:	0.55	0.69	0.63	0.68
17. EPC (3/8)	0.97	1.18	1.14	1.12	:	1.33	1.15	1.13	1.10
18. DRC (9+11/8)	0.93	1.006	0.89	0.99	:	0.76	0.82	0.81	0.77
19. Ratio of DRC to SPFX/OER (18/13)	0.69	0.75	0.66	0.74	:	0.56	0.61	0.60	0.57
20. Yield (kg./hectare)	2171	2750	2810	2935	:	3650	3950	4000	4050
21. Milling Ratio	1.55	1.54	1.53	1.53	:	1.57	1.54	1.53	1.53

Table 2. Cost and returns of irrigated rice production, 1978 - 1981

	1978	1979	1980	1981
		(pesos per kilogram)		
1. Gross Output at Actual Market Prices	1.96	2.14	2.29	2.61
2. Tradable Inputs at Actual Market Prices	0.31	0.27	0.26	0.35
3. Value-Added in Actual Market Prices (1 - 2)	1.65	1.87	2.03	2.26
4. Factor Cost Other Than Capital, Market Prices	1.04	0.97	0.76	1.05
5. Private Profitability (3 - 4)	0.61	0.90	1.27	1.21
6. Gross Output at World Market Prices	2.28	2.02	2.22	2.57
7. Tradable Inputs at World Market Prices	0.41	0.32	0.32	0.41
8. Value-Added in World Prices (6 - 7)	1.87	1.70	1.90	2.16
9. Domestic Resource Cost Other Than Capital	1.30	1.19	1.14	1.52
10. Social Profitability (8 - 9)	0.57	0.51	0.76	0.64
11. Domestic Capital at Opportunity Cost	0.10	0.11	0.11	0.11
12. Net Social Profits at OER (10 - 11)	0.47	0.40	0.65	0.53
13. Ratio of SPFX to OER	1.34	1.34	1.34	1.34
14. Net Social Profits at SPFX (8x13-9+11)	1.10	0.98	1.29	1.26
15. NPCO (1/6)	0.86	1.06	1.03	1.01
16. NPCI (2/7)	0.76	0.84	0.81	0.87
17. EPC (3/8)	0.88	1.10	1.07	1.05
18. DRC (9+11/8)	0.75	0.76	0.66	0.75
19. Ratio of DRC to SPFX/OER (18/13)	0.56	0.57	0.49	0.56
20. Yield	2171	2750	2810	2935
21. Milling Ratio	1.55	1.54	1.53	1.53

Table 3. Cost and returns of irrigated and rainfed rice production

	Irrigated				Rainfed			
	1978	1979	1980	1981	1978	1979	1980	1981
	(pesos per kilogram)							
1. Gross Output at Actual Market Prices	1.96	2.14	2.29	2.61	1.96	2.14	2.29	2.61
2. Tradable Inputs at Actual Market Prices	0.29	0.25	0.25	0.35	0.30	0.24	0.23	0.31
3. Value-Added in Actual Market Prices (1 - 2)	1.67	1.89	2.04	2.26	1.66	1.90	2.06	2.30
4. Factor Cost Other Than Capital, Market Prices	1.00	0.99	0.78	1.07	1.08	1.05	0.93	1.05
5. Private Profitability (3 - 4)	0.67	0.90	1.26	1.19	0.58	0.85	1.13	1.25
6. Gross Output at World Market Prices	2.28	2.02	2.22	2.57	2.28	2.02	2.22	2.57
7. Tradable Inputs at World Market Prices	0.53	0.39	0.41	0.50	0.36	0.31	0.31	0.37
8. Value-Added in World Prices (6 - 7)	1.75	1.63	1.81	2.05	1.92	1.71	1.91	2.20
9. Domestic Resource Cost Other Than Capital	1.80	1.21	1.26	1.64	1.60	1.49	1.63	1.92
10. Social Profitability (8 - 9)	-0.05	0.32	0.55	0.43	0.32	0.22	0.32	0.28
11. Domestic Capital at Opportunity Cost	0.09	0.11	0.11	0.11	0.10	0.14	0.15	0.14
12. Net Social Profits at OER (10 - 11)	-0.14	0.21	0.44	0.32	0.22	0.08	0.17	0.14
13. Ratio of SPFX to OER	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34
14. Net Social Profits at SPFX (8x13-9+11)	0.45	0.76	1.05	0.99	0.87	0.66	0.78	0.89
15. NPCO (1/6)	0.86	1.06	1.03	1.01	0.86	1.06	1.03	1.01
16. NPCI (2/7)	0.55	0.64	0.61	0.70	0.83	0.77	0.74	0.83
17. EPC (3/8)	0.95	1.16	1.12	1.10	0.86	1.11	1.08	1.04
18. DRC (9+11/8)	1.08	0.87	0.75	0.85	0.89	0.95	0.93	0.94
19. Ratio of DRC to SPFX/OER (18/13)	0.80	0.65	0.56	0.64	0.66	0.71	0.69	0.70
20. Yield	2286	2635	2695	2820	1650	1710	1615	1830
21. Milling Ratio	1.55	1.54	1.53	1.53	1.54	1.53	1.53	1.53

Table 4. Costs and returns of corn (shelled) production, 1975 and 1981

	1975	1981	Maisagana Program, 1981
	(pesos per kilogram)		
1. Gross Output at Actual Market Prices	0.95	1.20	1.20
2. Tradable Inputs at Actual Market Prices	0.12	0.27	0.42
3. Value-Added in Actual Market Prices (1 - 2)	0.83	0.93	0.78
4. Factor Cost Other Than Capital, Market Prices	0.78	0.88	0.55
5. Private Profitability (3 - 4)	0.05	0.05	0.23
6. Gross Output at World Market Prices	1.00	1.11	1.11
7. Tradable Inputs at World Market Prices	0.12	0.27	0.42
8. Value-Added in World Prices (6 - 7)	0.88	0.84	0.69
9. Domestic Resource Cost Other Than Capital	1.22	1.13	0.62
10. Social Profitability (8 - 9)	-0.34	-0.29	0.07
11. Domestic Capital at Opportunity Cost	0.08	0.07	0.02
12. Net Social Profits at OER (10 - 11)	-0.42	-0.36	0.05
13. Ratio of SPFX to OER	1.34	1.34	1.34
14. Net Social Profits at SPFX (8x13-9+11)	-0.12	-0.07	0.28
15. NPCO (1/6)	0.95	1.08	1.08
16. NPCI (2/7)	1.00	1.00	1.00
17. EPC (3/8)	0.94	1.10	1.13
18. DRC (9+11/8)	1.47	1.42	0.92
19. Ratio of DRC to SPFX/OER (18/13)	1.09	1.06	0.69
20. Yield (kg. per hectare)	875	1060	3690

Table 5. Costs and returns per ton of sugar (centrifugal) production, 1978

1. Gross Output at Actual Market Prices	1115.68
2. Tradable Inputs at Actual Market Prices	355.88
3. Value-Added in Actual Market Prices (1 - 2)	759.80
4. Factor Cost Other Than Capital, Market Prices	437.23
5. Indirect Taxes	258.43
6. Private Profitability (3 - 4 - 5)	178.80
7. Gross Output at World Market Prices	1292.13
8. Tradable Inputs at World Market Prices	355.88
9. Value-Added in World Prices (7 - 8)	936.25
10. Domestic Resource Cost Other Than Capital	634.74
11. Social Profitability (9 - 10)	301.51
12. Domestic Capital at Opportunity Cost	27.14
13. Net Social Profits at OER (11 - 12)	274.37
14. Ratio of SPFX to OER	1.34
15. Net Social Profits at SPFX (9x14-10+12)	592.69
16. NPCO (1/7)	0.86
17. NPCI (2/8)	1.00
18. EPC (3/9)	0.81
19. DRC (10+12/9)	0.70
20. Ratio of DRC to SPFX/OER (19/14)	0.53
21. Yield (tons per hectare)	4.81

Table 6. Private and social cost of rice production using average technology, 1978 to 1981

	Private				Social			
	1978	1979	1980	1981 :	1978	1979	1980	1981
	(pesos per kilogram)							
Primary Inputs								
Labour	0.41	0.35	0.32	0.37	0.41	0.35	0.32	0.37
Land	0.10	0.29	0.28	0.31	0.25	0.47	0.60	0.71
Capital	0.10	0.11	0.11	0.11	0.10	0.11	0.11	0.11
Unallocated:								
Irrigation	0.01	0.01	0.01	0.01	0.37	0.35	0.40	0.45
Processing and Transport	0.51	0.31	0.13	0.36	0.51	0.31	0.13	0.36
Tradable Inputs								
Seeds	0.04	0.04	0.05	0.05	0.09	0.08	0.09	0.08
Fertilizer	0.08	0.07	0.09	0.11	0.08	0.07	0.09	0.11
Chemicals	0.03	0.05	0.06	0.06	0.03	0.05	0.06	0.06
Irrigation	0.003	0.004	0.004	0.004	0.14	0.13	0.15	0.17
Processing and Transport	0.16	0.09	0.04	0.11	0.16	0.09	0.04	0.11

Source: Basic Data, Ministry of Agriculture, Philippines

Table 7. Private and social cost of rice production using recommended technology, 1976 to 1981

	Private				Social			
	1976	1979	1980	1981 :	1976	1979	1980	1981
	(pesos per kilogram)							
Primary Inputs								
Labour	0.36	0.38	0.54	0.57	0.36	0.38	0.54	0.57
Land	0.17	0.16	0.16	0.13	0.30	0.33	0.42	0.26
Capital	0.03	0.07	0.07	0.07	0.03	0.07	0.07	0.07
Unallocated:								
Irrigation	0.03	0.03	0.03	0.02	0.21	0.25	0.29	0.33
Processing and Transport	0.14	0.31	0.14	0.36	0.14	0.31	0.14	0.36
Tradable Inputs								
Seeds	0.02	0.02	0.02	0.02	0.08	0.06	0.08	0.06
Fertilizer	0.06	0.09	0.12	0.13	0.06	0.09	0.12	0.13
Chemicals	0.03	0.05	0.08	0.08	0.03	0.05	0.08	0.08
Irrigation	0.01	0.01	0.01	0.01	0.08	0.09	0.11	0.12
Processing and Transport	0.04	0.10	0.04	0.11	0.04	0.10	0.04	0.11

Source: Basic Data, Ministry of Agriculture, Philippines

Table 8. Private and social cost of irrigated rice production, 1978 to 1981

	Private				Social			
	1978	1979	1980	1981	1978	1979	1980	1981
	(pesos per kilogram)							
Primary Inputs								
Labour	0.39	0.36	0.34	0.38	0.39	0.36	0.34	0.38
Land	0.09	0.31	0.30	0.32	0.36	0.37	0.47	0.55
Capital	0.09	0.11	0.11	0.11	0.09	0.11	0.11	0.11
Unallocated:								
Irrigation	0.01	0.01	0.01	0.01	0.54	0.27	0.32	0.35
Processing and Transport	0.51	0.31	0.13	0.36	0.51	0.31	0.13	0.36
Tradable Inputs								
Seeds	0.04	0.04	0.05	0.06	0.08	0.08	0.09	0.08
Fertilizer	0.07	0.07	0.10	0.12	0.07	0.07	0.10	0.12
Chemicals	0.03	0.05	0.06	0.06	0.03	0.05	0.06	0.06
Irrigation	0.003	0.004	0.004	0.004	0.20	0.10	0.12	0.13
Processing and Transport	0.15	0.09	0.04	0.11	0.15	0.09	0.04	0.11

Source: Basic Data, Ministry of Agriculture, Philippines

Table 9. Private and social cost of rainfed rice production, 1978 to 1981

	Private				Social			
	1978	1979	1980	1981 :	1978	1979	1980	1981
	(pesos per kilogram)							
Primary Inputs								
Labour	0.42	0.42	0.45	0.40	0.42	0.42	0.45	0.40
Land	0.15	0.32	0.34	0.28	0.66	0.76	1.05	1.14
Capital	0.10	0.14	0.15	0.14	0.10	0.14	0.15	0.14
Unallocated:								
Irrigation	-	-	-	-	-	-	-	-
Processing and Transport	0.51	0.31	0.13	0.36	0.51	0.31	0.13	0.36
Tradable Inputs								
Seeds	0.04	0.06	0.06	0.07	0.11	0.12	0.14	0.12
Fertilizer	0.07	0.07	0.11	0.12	0.07	0.07	0.11	0.12
Chemicals	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.01
Irrigation	-	-	-	-	-	-	-	-
Processing and Transport	0.15	0.09	0.04	0.11	0.15	0.09	0.04	0.11

Source: Basic Data, Ministry of Agriculture, Philippines

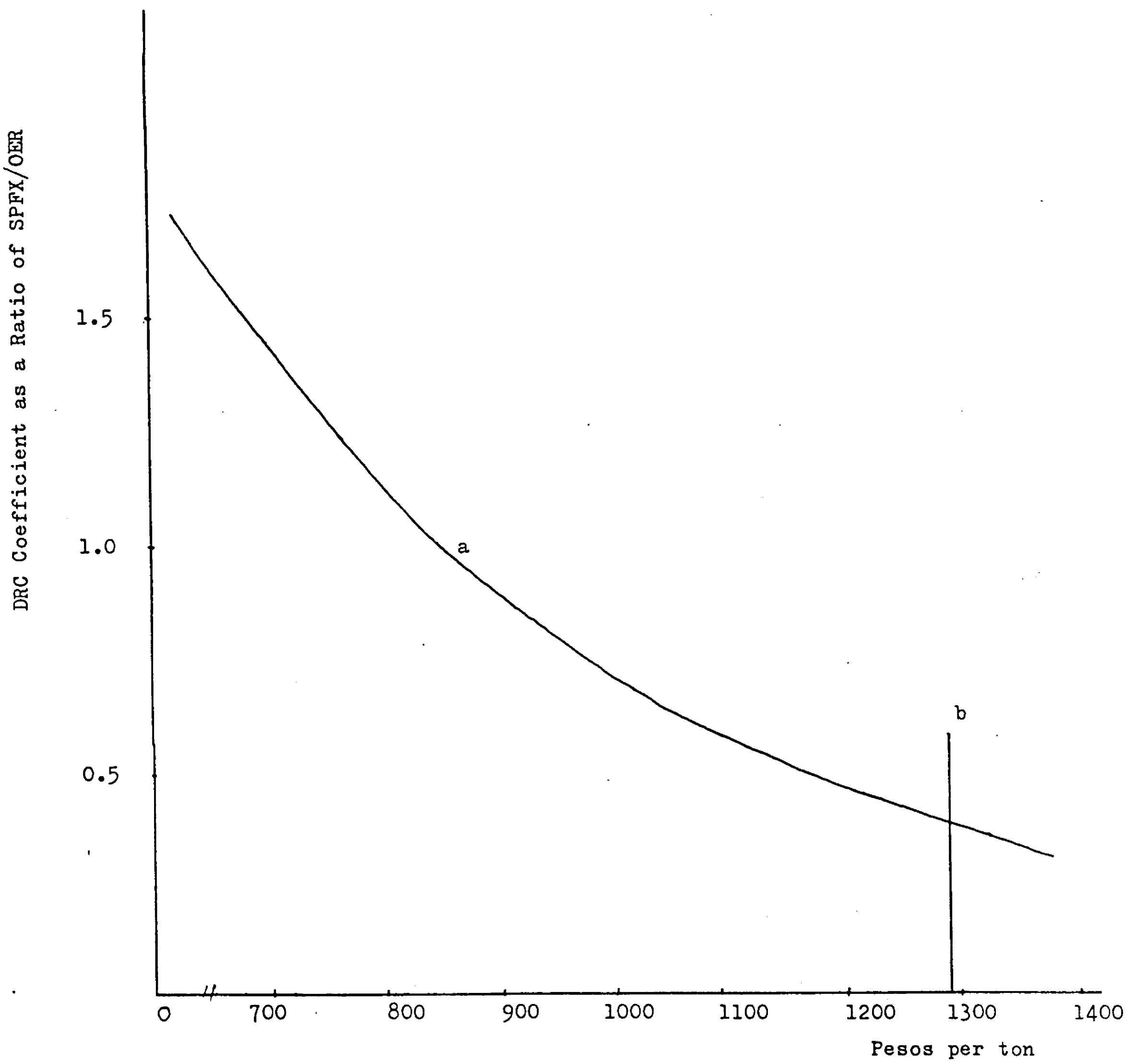

Figure 1. Sensitivity of DRC to Changes in World Sugar Prices

[a]border price equivalent to P850 (U.S. $115) at which Philippine sugar production would lose its comparative advantage

[b]border price of sugar in 1978